7: McKern A-4,5 (1920-1921) 1929 OU9 Tonga OU9

There seems to have been many named ornamental trees growing on and about Kafoa. Among these were the great *ake* called Tukungaalofia, the *heilala* called Mamatataaemaukava (The-onlookers-who-brought-no-kava), two *hehea* trees called Hafeofafine, a large "almond" called Vakaikaevete (Look-while-it-is-undone), and a large hala (*fala; Pandanus*) called Kikatenofa (Squeal-and-I-will-stay).

The story mentions a row of eight stones, where pigeon snares were set, as situated near the mound Kafoa and associated with the big *ake* and *tutuna* trees where pigeons were made to fly, and a house called Kolonga situated near the pigeon mound. Neither of these sites, if indeed they ever existed, could be located. The reference is undoubtedly to a pigeon mound (p. 19).

The evidence furnished by these traditions and by the structural peculiarities of the mound, gives occasion for doubt as to whether Kafoa was an *esi* or a pigeon mound. The mention of pigeon snaring and the presence of the central pit on the top of the mound indicates a pigeon mound. The natives, most of whom consider the mound as an *esi*, explain the presence of the pit in various ways: the place where a *heilala* tree was planted; the chief's bathing place; the place where the chief sat; the cooking place; the site of a house. But they do not satisfactorily explain why a pit should be constructed in which to plant a tree, why a chief should choose to sit at an elevation lower than that of his attendant social inferiors (a drastic breach of Tongan etiquette) or what an oven was doing on a chief's *esi* (only commoners cooked and they were not permitted to go onto a chief's *esi*). The explanation that the pit was a bathing place is reasonable but savors of rationalization. On the other hand, one informant, who described the place as a pigeon mound, actually gave a more or less detailed description of how the pit was used for that purpose. In Haapai and Tongatabu there are mounds of this type intimately associated with typical pigeon mounds, but some of these are consistently called *esi*.

The place is generally looked upon as an *esi* and the myth relating of its origin favors this interpretation. It is difficult to understand why a great number of ornamental shrubs and trees, many of them highly valued for their fragrant blossoms and some of them actually monopolized in use by chieftains of high rank, should be planted about a pigeon mound. The translations of the names of some of these trees: The-onlookers-who-brought-no-kava, Look-while-it-is-undone, Squeal-and-I-will-stay, have no apparent reference here to pigeon snaring. On the other hand, the mention of kava suggests the use of the place for kava ceremonies, associated with *esi*. As for the central pit, there are in Tonga other so-called *esi* similarly equipped (p. 18), although the use of the pit remains unaccounted for.

As a matter of fact, the truth is probably generous to both explanations. The evidence clearly indicates an *esi* and the interpretation of the structure

55: Anderson D,T-5 (1777) 1967 OU9 Tonga OU9

the large end against a stone fix'd in the ground for that purpose, and the other being push'd against the door serves as a strong bar, which makes it as necessary to rap here at the door as at a gate in England before you can enter an inclosure. In a great many of them there is a smaller inclosure within, this also often with a door, where the house of the principal person is immediately plac'd, and near it or very often in the outer one houses of an inferior sort for servants and dependents. There are sometimes several little places again within this that have fences and houses, but communicate freely with each other, and in most there is commonly a pretty spot of short grass, though of no regular figure, before them with sweet smelling shrubs call'd Ma'eele[1] and Hooe[2] planted up and down and some other trees that produce beautifull flowers. The outer inclosure has commonly such things as they often want planted in them, as Cocoa nut trees or some plantanes and bread fruit, but no considerable plantations of Plantanes or Yams.

Beyond this a mile or two we generally found the Plantations more extensive but open, and still farther on a great quantity of uncultivated land coverd with grass as high as the Knee. Our guides said if we advanc'd that way we should still find a waste uncultivated country, or as they call it Vâô,[3] but they probably did it only to save themselves a little fatigue, for some miles beyond this the land seem'd to rise a little higher and had a great many Cocoa trees, both signs of its being cultivated. It could also be observ'd that even in this place the soil was good, and it is probable many of the spots only lay fallow, for we saw two or three large plantane fields that had lately been broke in from such ground. It is remarkable that when on the highest part, which is at least a hundred feet above the level of the sea, we often found the same coral rock which is found at the shore, projecting above the surface in the paths; and in many places where there were large breaches with a small quantity of stinking water at the bottom, it was always in the solid coral shatterd or seperated as it were by violence.

At one place we fell in with a house where they were manufacturing their cloth, which though extensive in itself is a very simple operation. They take the slender stalks (or trunks) of the papper mulberry plant, which they cultivate for that purpose and seldom grows more than six or seven feet in height or four fingers in thickness, from which they strip the bark and scrape off the outer rind with

[1] Maile, *Alyxia stellata*, a shrub with fragrant long slender stems, abundant small leaves and dark red berries, much used for wreaths.

[2] Hoi, *Dioscorea bulbifera*, one of the yams, with small flowers in spike-like clusters.

[3] *vao*, land in its natural uncultivated state. Anderson is very accurate.

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

137 824 262 This species is of ancient introduction and is cultivated as a staple food crop throughout Tonga. A large number of varieties are recognized by the Tongans.

Tongan name: *talo.*

Genus **Alocasia** Necker

137 **Alocasia macrorrhiza** (Linnaeus) Schott, Oesterr. Bot. Wochenbl. 4: 409, 1854.

Large herb with stem 1 m. or more tall and up to 15 cm. or more in diameter. Leaves cordate-sagittate, glabrous, obtuse to acuminate, margins entire or wavy, up to 1 m. long and 60 cm. wide but some varieties smaller, petiole up to 1 m. or more long, sheathing at base. Flowers monoecious, on a fleshy spadix, enclosed in a greenish spathe.

[262] [824] Occasional in plantations. This southern Asiatic species is now widely distributed in Polynesia. The stem is sometimes used as food.

Tongan name: *kape.* The following varieties are recognized: *kape hina, fahenga 'uli, fahenga enge'enga.*

[247] [824] A number of varieties of *Caladium* [*C. bicolor* (Aiton) Ventenat ?] were seen as cultivated ornamentals about dwellings.

Family LEMNACEAE

Genus **Lemna** Linnaeus

Lemna minor Linnaeus, Sp. Pl., 970, 1753.

Minute, floating herb, often growing in large colonies, stem elliptic, 2-3 mm. long, green above, paler or reddish beneath, functioning as a leaf, with threadlike roots. Flowers very inconspicuous.

Tongatapu: in bay of lagoon near Pea, Nov. 23, 1951, *Hürlimann 324.*

The available material of this specimen is meager and the identification is not certain. No previous report of *Lemna* from Tonga is known.

Of Old World origin, now of wide distribution.

Family BROMELIACEAE

Genus **Ananas** Adanson

Ananas comosus (Linnaeus) Merrill, Interpret. Herb. Amboin., 133, 1917.

[245] The pineapple is seen occasionally in plantations, but I saw no extensive plantings.

[824] The Tongan name for the pineapple is *faina.* The following varieties are recognized: *faina,* fruit of medium size, the leaf margins spiny; *faina ha'amoa,* fruit large and not as sweet as other varieties, the leaf spiny only toward the apex; and *faina 'initia,* the leaves at the top of the fruit red.

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

Genus **Rhoeo** Hance

137 **Rhoeo discolor** (L'Héritier) Hance, in Walpers. Ann. Bot. Syst. 3: 660, 1852.

Low herb with short, thick, creeping, fleshy stems ascending up to 30 cm. Leaves numerous, narrowly lanceolate, entire, acuminate, dark green above, purple beneath, up to 30-40 cm. long and 4-6 cm. wide, fleshy, petiole about 1 cm. long, sheathing stem. Flowers small, white, about 1 cm. wide, several, in axillary, racemose clusters, surrounded by two large, purplish, boat-shaped bracts.

Tongatapu: on coral rocks near sea below Niutoua village, Mar. 2, 1953. *Yuncker 15129.*

[824] [247] [764] Found throughout Tonga. Often planted in cemeteries, from where it becomes established as an escape. A tropical American species now widely grown as an ornamental in warm climates.

Genus **Zebrina** Schnizlein

Zebrina pendula Schnizlein, Bot. Zeit. 7: 868, 1849.

Tender, decumbent herb with weak, semi-prostrate, creeping stems. Leaves alternate, ovate-lanceolate, acute, 3-6 cm. long, purple beneath, silvery green above with purple stripes, petiole tubular and sheathing stem. Flowers reddish or purplish, small, short-pedicellate, in few-flowered cymose clusters enclosed by sheathing bracts.

Tongatapu: along trail between Ha'akame village and sea, Mar. 12, 1953, *Yuncker 15275.*

A Mexican plant now of wide distribution as an ornamental; occasional to frequent as a weed in plantations and waste areas throughout Tonga.

Family LILIACEAE

Genus **Dianella** Lamarck

Dianella ensifolia (Linnaeus) de Candolle, in Redouté, Liliacées, 1, pl. 1, 1802.

Rather coarse, short-stemmed, herbaceous plant. Leaves distichous, linear, swordlike, up to 50 cm. or more long and 2 cm. wide, gradually long-acuminate, finely parallel-nerved, narrowing to a clasping petiolar base. Flowers blue to white, small, in terminal panicles up to 60 cm. or more long.

Tongatapu: in sandy soil under trees and shrubs near beach, Sopu, west of Nuku'alofa, May 30, 1953, *Yuncker 16212.*

'Eua: *Lister.*

Kao: in rocky soil in open forest on upper slope, alt. about 600 m., May 6, 1953, *Yuncker 15893.*

Vava'u: *Crosby;* along upper rim of limestone coastal cliff above Leimatua, May 20, 1953, *Yuncker 16081.*

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

137 'Eua: ravine of Lakatoha River near Ohonua, Nov. 10, 1951, *Hürlimann 236;* same location, Apr. 2, 1953, *Yuncker 15613.*

Lifuka: climbing in shrubbery of seaside thicket, north of Pangai village, Apr. 24, 1953, *Yuncker 15704.*

Occasional to frequent in thickets throughout Tonga. A south African plant now widely disseminated in warm countries.

Tongan name: *taupo'ou.*

Genus **Smilax** Tournefort

Smilax vitiensis (Seemann) A. de Candolle, in DC. Monogr. Phanerog. 1: 204, 1878.

Rather slender, woody vine. Leaves alternate, round-ovate, abruptly short-pointed, base rounded, cordate, palmately 5-7-nerved, up to 15 cm. long and 15 cm. wide, petiole up to 5 cm. or more long, with a pair of stipular tendrils. Flowers greenish, on slender pedicels up to 2 cm. long, in axillary, pedunculate umbels, peduncle up to 8 cm. or more long.

'Eua: climbing in trees, forest above Fuai plantation, near center of island, Mar. 21, 1953, *Yuncker 15401;* in forest on seaward terrace along trail descending to Lokupo, Mar. 27, 1953, *Yuncker 15512.*

Occasional on 'Eua. Also in Fiji.

Tongan name: *matafu'i.*

[244] [824] [247] The cultivated garden asparagus (*Asparagus officinalis* Linnaeus var. *altilis* Linnaeus), onions (*Allium cepa* Linnaeus), and leeks (*Allium porrum* Linnaeus) are occasionally cultivated as vegetables. *Eucharis grandiflora* Planchon and Linden is a favorite ornamental species.

Family AMARYLLIDACEAE

Genus **Zephyranthes** Herbert

Zephyranthes candida Herbert, Curtis's Bot. Mag., pl. 2607, 1826.

Small, bulbous plant with flat, narrow, grasslike leaves up to 20-30 cm. long. Flowers funnel-shaped, white or slightly rose-tinged on outside, up to 4 or 5 cm. long, solitary on a hollow scape about as long as leaves.

Tongatapu: in roadside ditch near Nuku'alofa, Mar. 7, 1953, *Yuncker 15218.*

[247] [764] [824] An ornamental planted about dwellings and in cemeteries but escaping to roadsides and waste areas. A South American species now widely grown as an ornamental in warm countries.

Tongan name: *feu'u.*

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Genus **Crinum** Linnaeus

Crinum asiaticum Linnaeus, Sp. Pl., 292, 1753. 137

Coarse, bulbous herb. Leaves numerous, oblong, straplike, acute, up to 2 m. long or more and 25 cm. wide, fleshy, clasping at base. Flowers numerous, at top of fleshy scape, white, fragrant, perianth tube up to about 10 cm. long, filaments white, styles purplish.

Niuatoputapu: in grassy area near old well in Hihifo, Dec. 7, 1951, *Hürlimann 399*.

Occasionally cultivated as an ornamental throughout Tonga. A southern Asiatic species now widely cultivated in warm climates. [247] [824]

Crinum pedunculatum R. Brown, Prodr. Fl. Nov. Hollandiae, 297, 1810.

Fleshy, bulbous herb. Leaves fleshy, numerous, up to 1 m. or more long and 10 cm. wide. Flowers numerous, umbellate at top of stout, solid, fleshy scape, perianth tube green, up to 10 cm. long, with linear, white segments up to 5 cm. long.

'Eua: *Lister*.

An Australian species now widely cultivated as an ornamental. [247] [824]

Genus **Furcraea** Ventenat

? **Furcraea gigantea** Ventenat, Soc. Philom., Bull. 1: 65, 1793.

Coarse, short-stemmed plant. Leaves nearly flat, spreading rosette fashion from short stem, linear-lanceolate, up to 1 m. or more long, fleshy, margin armed with strong, recurved teeth, apex acuminate and ending in a short, sharp spine. Flowers white, commonly replaced by bulbils, in large, terminal, paniculate clusters.

Tongatapu: forming a colony along side of trail below Ha'akame village, Mar. 12, 1953, *Yuncker 15287*.

Introduced for the fibers obtained from the leaves and used in cordage. Now established locally. [283] [824]

Tongan name: *faumalila*.

FAMILY TACCACEAE

Genus **Tacca** Forster

Tacca leontopetaloides (Linnaeus) O. Kuntze, Rev. Gen. Pl. 2: 704, 1891.

Herb, up to 50 cm. or more tall. Leaves radical, large, palmately three-parted, each division in turn deeply lobed and divided into acuminate lobes and teeth, petioles up to 60 cm. or more long. Flowers pendent, greenish, numerous, in umbellate clusters at top of a hollow, bracteate scape sometimes up to about 1 m. tall; fruit globose, ribbed, fleshy, yellowish when ripe, crowned with withered floral parts. Tubers up to 8-10 cm. in diameter, sometimes larger under cultivation.

Tongatapu: *Moseley;* in calcareous soil in thicket near shore, Sopu, Feb. 25, 1953, *Yuncker 15004*.

'Eua: in border of pastured land near center of island, Apr. 5, 1953, *Yuncker 15639*.

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Cultivated[1] as an ornamental in villages and cemeteries. A native southeastern Asiatic species now widely distributed as an ornamental in warm countries.

137 247 764 824

FAMILY MUSACEAE

Genus **Musa** Linnaeus

Musa nana Loureiro, Fl. Cochinchinensis. 644. 1790.

I was unable to determine with certainty the presence of this dwarf Chinese banana, but it was claimed to grow in Tonga. If so, it is probable that some of the Tongan names listed under the following species refer to it.

Musa paradisiaca Linnaeus subspecies **normalis** O. Kuntze, Rev. Gen. Pl. 2: 692, 1891.

The fruit of this subspecies, commonly known as the plantain, is usually cooked before eating. The Tongan name for this subspecies is *hopa*. The following varieties are recognized by the Tongans.

137 262 824 [252]

Fetau kula: fruit is round.
Fetau ulu'ikuma.
Lchia: bunch bears three or four hands of very large fruits.
Maholi hina.
Maholi 'uli.
Misipeka: small bunches of red fruits.
Pikipiki hina: fruit is small, white, the flesh firm.
Puko: small bunches of fruit nearly as large as the *lchia* variety.
Putalinga kula: stem is large, red, the bunches large, the fruit the size of those of the *puko* variety.
Putalinga puku.
Tatcau.
Tokoni voi: large bunches of hard-fleshed fruit.
Tu'utu'ukautala.
U'hotaha.
Vaivi kako: fruit is medium-sized, long, round, curved.
Vaivi puki.

Musa paradisiaca Linnaeus subspecies **sapientum** (Linnaeus) O. Kuntze. Rev. Gen. Pl. 2: 692, 1891.

[252] The fruit of this subspecies, one of the bananas of commerce, is generally eaten raw. The following varieties are recognized by the Tongans.

Mahimahi: stem is short to medium, the bunches and fruit small.
Mamae: leaves are purplish, the fruit white and short.
Pata lahelahe: stem is medium tall, the fruit green with whitish bloom.
Pata tonga: stem is medium tall, the fruit green, somewhat ribbed, larger than variety *pata lahelahe.*
Siaine fisi: stem is tall, with large bunches of large fruits.
Siaine ha'amoa: stem is medium tall, the fruits and bunches large.
Siaine initia: stem is tall and red, with large clusters of red fruits.
Siaine tonga: stem is short, with short clusters of short fruits.

[1] /Belamcanda chinensis (Linnaeus) de Candolle -- Analyst/

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

It is probable that some of the above varieties are incorrectly placed as to subspecies, as it was not possible to determine their exact relationship. So far as I know, no wild species of *Musa* occur in Tonga. Plantains and bananas are grown extensively throughout the group and are an important item in the diet of the Tongans. A comparatively large number of bunches are shipped annually to the New Zealand markets.

137 262 824 [439]

Family ZINGIBERACEAE

Genus **Zingiber** Adanson

Zingiber zerumbet (Linnaeus) J. E. Smith, Exot. Bot. 2: 103, pl. 112, 1804.

Herbaceous plant with pubescent, leafy branches rising to about 1 m. tall from a thickened, fleshy rhizome. Leaves alternate, distichous, entire, oblong-elliptic or lanceolate, acuminate, clasping the stem at the base, up to about 30 cm. long and 5 cm. wide, pubescent beneath. Flowers white or pale yellow, in a large, bracteate, cone-like spike at top of a leafless scape up to about 30 cm. tall, bracts rounded, overlapping, becoming red.

Tongatapu: in a low wet area near Nualei, Mar. 9, 1953, *Yuncker 15221.*

'Eua: in thicket at margin of forest near summit of central part of eastern ridge. Mar. 24, 1953, *Yuncker 15455.*

Vava'u: *Crosby.*

Tafahi: at summit of Piu 'o Tafahi, Dec. 11, 1951, *Hürlimann 459.*

Niuatoputapu: on southward slope of mountain ridge opposite Vaipoa, Dec. 25, 1951, *Hürlimann 636.*

Frequent in thickets throughout the group. An Asiatic species now widely distributed in warm countries.

Tongan name: *angoango.*

The rhizome is used in preparing medicines.

[278] [824]

Genus **Hedychium** Koenig

Hedychium coronarium Koenig, Retz. Observ. Bot. 3: 73, 1783.

Erect herb, stems up to 1 m. tall from a stout rootstock. Leaves distichous, oblong-lanceolate to lanceolate, acuminate, up to 50 cm. more long and 10 cm. wide, petiole short clasping stem with an elongated sheathlike portion. Flowers very fragrant, white turning yellow, perianth tube slender, up to 6 or 8 cm. long, in dense, terminal, bracteate spikes, bracts oblong to obovate or lanceolate, imbricate.

Tongatapu: in moist area along trail below Fatai village, Mar. 10, 1953, *Yuncker 15263.*

'Eua: in Pangai village, Mar. 25, 1953, *Yuncker 15488.*

Common in villages as an ornamental and occasionally as an escape. An Indian species now widely distributed in warm countries as an ornamental.

[247] [824]

Tongan name: *tevunga.*

The aromatic parts of this plant are used to scent oil.

[303] [824]

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Genus Curcuma Linnaeus

137 **Curcuma longa** Linnaeus, Sp. Pl., 2, 1753.

Erect, leafy, herbaceous plant with aromatic, fleshy rootstock. Leaves elliptic-oblong, distichous, acuminate, finely pinnately nerved, petiole about as long as blade, sheathing at base. Flowers several, yellowish, in axils of greenish bracts forming a dense, cone-like or cylindric head at end of leafless peduncle.

Tongatapu: in swampy area below Nualei village, Mar. 9, 1953, *Yuncker 15248.*

'Eua: in deep forest on ridge above sea-facing terraces above Lokupo, Mar. 27, 1953. *Yuncker 15537.*

Vava'u: *Crosby.*

Occasional throughout Tonga. An Indian species now widely disseminated in warm countries.

Tongan name: *ango.*

[386] [252] [278] [824] The rootstock provides a yellow dye and the leaves are used to wrap fish and in the preparation of medicines.

Family CANNACEAE

Genus Canna Linnaeus

Canna indica Linnaeus, Sp. Pl., 1, 1753.

Smooth, erect, rhizomatous herb, up to about 1.5 m. tall. Leaves oblong-ovate or lanceolate, entire, acute to acuminate, with long, basal, petiolar part sheathing stem, blade up to 50 cm. or more long and 20-25 cm. wide, pinnately nerved, lateral nerves slender and numerous. Flowers irregular, medium to large, showy, red or yellow, in terminal racemose or paniculate clusters; fruit a warty, bristly capsule, seeds globose, hard, black.

Tongatapu: forming large patches in low moist areas near Vaini, Feb. 26, 1953, *Yuncker 15060.*

'Eua: in low moist area between Pangai village and Fuai, Mar. 25, 1953, *Yuncker 15472.*

Vava'u: *Crosby;* in waste areas near northwestern coastal cliff, May 25, 1953, *Yuncker 16159.*

[247] [824] Common in low moist areas throughout Tonga. A tropical American plant now of pantropic distribution. A number of horticultural forms are grown for ornament.

Tongan name: *misimisi.*

Family MARANTACEAE

Genus Maranta Linnaeus

Maranta arundinacea Linnaeus, Sp. Pl., 2, 1753.

Erect, slender, glabrous, somewhat dichotomously branched herb, up to about 1 m. tall, rootstock fleshy. Leaves rather thin, ovate-oblong, acuminate, base rounded, blade

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Family CHENOPODIACEAE

The beet (*Beta vulgaris* Linnaeus), chard (*Beta vulgaris* var. *cicla* Linnaeus), and spinach (*Spinacia oleracea* Linnaeus) are occasionally cultivated in plantations as vegetable crops. [137] [244]

Family AMARANTHACEAE

Genus **Amaranthus** Linnaeus

Amaranthus blitum Linnaeus, Sp. Pl., 990, 1753.

Low, spreading, nearly prostrate herb. Leaves small, alternate, obovate, obtuse, base acute, on slender petioles. Flowers very small, in few-flowered, axillary, subsessile clusters.

'Eua: weed beside trail near center of island, Apr. 5, 1953, *Yuncker 15643.* A depauperate specimen but seemingly this species.

Not common in Tonga.

Amaranthus paniculatus Linnaeus, Sp. Pl., ed. 2, 1406, 1763.

More or less pubescent herb. Leaves oblong-ovate to lanceolate. Flowers very small, in numerous, long, slender, ascending, dark red or yellowish spikes arranged in large, showy, paniculate clusters.

Vava'u: *Barclay.*

Widely cultivated as an ornamental. Occasional as a weed. [247]

Amaranthus viridis Linnaeus, Sp. Pl., ed. 2, 1405, 1763.

Coarse, glabrous, erect herb, up to about 1 m. tall. Leaves alternate, ovate to ovate-lanceolate, obtusish, base acute, long-petiolate. Flowers minute, greenish, sessile, in axillary clusters, in long, densely flowered, terminal and axillary spikes; fruit a membranous utricle.

Tongatapu: weed in banana plantation, Nualei, Nov. 1, 1951, *Hürlimann 100;* dooryard weed, Fu'amotu village, Mar. 4, 1953, *Yuncker 15164.*

'Eua: plantation weed on western side of island, Mar. 25, 1953, *Yuncker 15470.*

Tafahi: roadside weed between township of Tafahi and Faihavanui, Dec. 15, 1951, *Hürlimann 541.*

A weed of plantations and waste areas throughout Tonga. Widespread in warm climates.

Tongan names: *longolongo'uha, tupu'a.*

The young leaves are sometimes eaten as a vegetable.

Hemsley lists *Amaranthus caudatus* Linnaeus as collected by Cook on Tongatapu. This is an ornamental species, and there is some question as to whether it was in Tonga at the time of Cook's voyages. [262] [824]

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Tongatapu: near shore, Nuku'alofa, Nov. 23, 1951, *Hürlimann 299.* 137

Vava'u: in wet boggy soil, margin of Ngofe swamp, May 19, 1953, *Yuncker 16043.*

Occasional as a waste area weed. Pantropic.

Tongan name: *fisi'i'ano.*

Genus **Gomphrena** Linnaeus

Gomphrena globosa Linnaeus, Sp. Pl., 224, 1753.

Low, branching, hairy herb. Leaves opposite, ovate to oblanceolate, cuspidate, entire, ciliate, up to 6 cm. or more long. Flowers small, in dense, chaffy-bracteate, pink, red or white, globose, cloverlike heads, on long, axillary and terminal peduncles and subtended by two ovate, involucre-like, leafy bracts.

Vava'u: *Barclay.*

Grown throughout Tonga as an ornamental, occasionally escaping. A tropical American species now widely distributed as an ornamental in warm and temperate climates. [247] [824]

Family NYCTAGINACEAE

Genus **Boerhavia** Linnaeus

Boerhavia diffusa Linnaeus, Sp. Pl., 3, 1753.

Prostrate, glabrous or subglabrous herb, widely branching with reddish or green stems. Leaves scattered, somewhat fleshy, lanceolate to ovate, obtuse or acutish, base commonly obtuse, wavy-margined, lighter green or red beneath, up to 4 cm. long, petioles short. Flowers pinkish, small, tubular, on slender pedicels, in axillary and terminal, umbellate-paniculate clusters; fruit small, glandular, club-shaped, about 3 mm. long.

Lifuka: prostrate weed, in waste area between Pangai and southern end of island, Apr. 28, 1953, *Yuncker 15779.*

Vava'u: *Crosby.*

Tafahi: on volcanic rock, Dec. 15, 1951, *Hürlimann 516.*

Niuatoputapu: on mixed volcanic-calcareous soil, plantation near Matavai, Dec. 26, 1951, *Hürlimann 630.*

Occasional as a plantation and waste-area weed. Pantropic.

B. repens L. in Burkill's list.

Tongan name: *akataha kula.*

Genus **Pisonia** Plumier

Pisonia aculeata Linnaeus, Sp. Pl., 1026, 1753.

Dense, somewhat scrambling shrub, with stiff, axillary, recurved, sharp spines up to 1 cm. long. Leaves alternate, ovate-oblong or elliptic, obtuse or acutish, the base acute, up to 10 cm. long. Flowers yellowish-white, small, in terminal and axillary, pedunculate, cymose clusters; the fruit oblong or clavate, up to 15 cm. long, viscid-glandular.

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137 Tongatapu: on the shore eastward of Ma'ofanga, Oct. 29, 1951, *Hürlimann 20.*

Tafahi: near Fakafafa moe Tauloto, on sandy coral soil, Dec. 17, 1951. *Hürlimann 610.*

Occasional. Pantropic.

Tongan name: *vi taha.*

Pisonia grandis R. Brown, Prodr. Fl. Nov. Hollandiae 1: 422, 1810.

Medium to large, soft-wooded tree. Leaves opposite, rather thin, oval-ovate, obtuse to acutish, base acute, up to 20 cm. or more long and 10 cm. wide, petiole up to 5 cm. or more long. Flowers small, fragrant, in terminal, cymose clusters; fruit glandular.

Tongatapu: in forest between village of Niutoua and shore, Mar. 2, 1953, *Yuncker 15127.*

Nomuka: *fide* Burkill's list.

Kifuka: *Harvey.*

Vava'u: *Crosby.*

Occasional. From the Moluccas, Borneo, Australia, Marianas, the Philippines through Polynesia.

P. inermis Forst. in Hemsley's list.

Tongan name: *fotulona.*

[824 H17] The timber is used for fence posts and in general construction work.

Genus **Bougainvillea** Commerson

Bougainvillea spectabilis Willdenow, Sp. Pl. 2: 348, 1799.

Scrambling or climbing, armed, woody, vinelike shrub. Young growth finely pubescent. Leaves alternate, entire, elliptical, acute at both ends. Flowers nearly 2.5 cm. long, surrounded by three, large, purplish-red, ovate, veiny bracts.

This introduced ornamental is occasionally planted about dwellings. One or two specimens were noted along roadsides. It is a Brazilian species now pantropic in cultivation.

Tongan name: *felila.*

[247 824] *Mirabilis jalapa* Linnaeus, the common garden four-o'clock, is cultivated as an ornamental garden plant.

FAMILY PHYTOLACCACEAE

Genus **Rivina** Linnaeus

Rivina humilis Linnaeus, Sp. Pl., 121, 1753.

Shrublike herb up to 1 m. tall. Leaves alternate, ovate-lanceolate, acute at both ends, 5-8 cm. long and 2-3 cm. wide, glabrous, bright green, pinnately nerved, petioles 2-3 cm. long. Flowers small, white, pale lavender or greenish, on slender pedicels 2-4 mm. long, in terminal and axillary, cylindrical racemes; fruit red, fleshy, one-seeded.

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

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FAMILY MENISPERMACEAE

Genus **Stephania** Loureiro

Stephania forsteri (de Candolle) A. Gray, U.S. Expl. Exped., Bot. 1: 36, 1854.

Soft-wooded, twining, glabrous vine. Leaves alternate, round-ovate, bluntly pointed, the base rounded to retuse, peltate, up to 12 cm. or more long and 10 cm. wide, the petiole slender, nearly as long as the blade, attached 2-3 cm. from the margin of the blade. Flowers greenish, dioecious, in compound umbellate clusters; the fruit about 6 mm. in diameter, flattened and slightly laterally concave, red.

Tongatapu: *U.S. Expl. Exped.*

'Eua: in thicket near the center of the island, Mar. 28, 1953, *Yuncker 15544.*

Nomuka: in thicket along the road encircling the island between the sea and the central lake, Apr. 30, 1953, *Yuncker 15823.*

Vava'u: *Harvey; Crosby;* in thicket along the road near Houma village, May 22, 1953, *Yuncker 16115.*

Frequent in thickets throughout Tonga. Malaya to Polynesia.

S. hernandiaefolia Walp. in Hemsley's and Burkill's lists.

FAMILY ANNONACEAE

Genus **Cananga** Hooker f. and Thomson

Cananga odorata (Lamarck) Hooker f. and Thomson, Fl. India 1: 130, 1855.

Tree, up to 15 m. or more tall. Leaves alternate, elliptic-oblong, acute, base rounded, obtuse, entire, up to 20 cm. or more long and 7 cm. wide, pubescent, pinnately nerved, petiole mostly less than 2 cm. long. Flowers greenish yellow, drooping, pubescent, very fragrant, the petals linear-lanceolate, up to 8 cm. or more long, on long, puberulent pedicels, in axillary, pedunculate, umbellate clusters; fruit oblong, fleshy, black, seeds numerous.

Tongatapu: *Graeffe; Moseley;* in Navutoka village, Feb. 27, 1953, *Yuncker 15086;* in Ma'ofanga village, Nov. 23, 1951, *Hürlimann 312.*

'Eua: in Pangai village, Apr. 7, 1953, *Yuncker 15658.*

Vava'u: *Crosby.*

Introduced and cultivated in villages throughout Tonga. A southern Asiatic plant now widely cultivated in tropical countries.

Tongan name: *mohokoi.*

The wood is used for canoe outriggers; the leaves and bark in medicines; and the flowers for ornaments, in leis, and for scenting oil.

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Genus **Polyalthia** Blume

Polyalthia amicorum A. C. Smith, sp. nov. (fig. 9).

Arbor ad 5 m. alta trunco circiter 45 cm. diametro partibus novellis pilis fuscis 0.1-0.3 mm. longis exceptis glabra; ramulis gracilibus apices versus haud 1 mm. diametro teretibus

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copiosissime lenticellatis, hornotinis nigro-purpurascentibus vel brunneis flexuosis demum cineris; petiolis gracilibus canaliculatis 1.5-3 mm. longis; foliorum laminis in sicco papyraceis fusco-viridibus anguste oblong-ellipticis (5-) 7-11.5 cm. longis, 2-3.7 cm. latis, basi inaequilateraliter rotundatis vel subcordatis et in petiolum subito decurrentibus, apice obtusis vel rotundato-cuspidatis, margine integris et paullo incrassatis, obscure pellucido-punctatis, costa utrinque striato-rugulosa supra plana subtus prominente, nervis secundariis utrinsecus 7-9 arcuato-adscenditibus anastomosantibus et rete venularum copioso utrinque manifeste prominulis; inflorescentiis infructescentiisque desideratis. 137

Tongatapu: tree about 5 m. tall, stem about 45 cm. in diameter, near Pikula, June 1, 1953, *Yuncker 16228* (type in U.S. Nat. Herb., nos. 2128585 and 2157731).

Tongan name: *motelolo.*

In spite of the absence of flowers and fruits, the cited specimen can confidently be referred to *Polyalthia,* representing the first Tongan record and an extension of the genus eastward from Fiji. Its closest relative seems to be the Fijian *P. amygdalina* (A. Gray) Gillespie, to which it is strikingly similar in indument of young parts and in leaf shape and leaf texture. However, the new species differs from *P. amygdalina* in the crowded lenticels of its branchlets, in its smaller leaf-blades (those of the Fijian species attaining a size of about 15 × 5 cm.), and in having its leaf-apices obtuse or rounded-cuspidate rather than acute. Another Fijian species suggesting *P. amicorum* in vegetative characters is the Lauan *P. laddiana* A. C. Smith, but that has more sparsely lenticillate branchlets and broader, ovate-elliptic leaf-blades which are acute to acuminate at apex.

Genus Artabotrys R. Brown

Artabotrys uncinatus (Lamarck) Merrill, Philippine Jour. Sci. 7C: 234, 1912.

Climbing shrub with spreading, somewhat zigzag branches. Leaves elliptic- or oblong-lanceolate, acuminate, the base acute, somewhat glossy, entire, up to 15 cm. or more long and 4 or 5 cm. wide, the petiole scarcely 1 cm. long. Flowers greenish yellow, fragrant, 2.5 cm. or more long, on stout, hooked, axillary peduncles; the fruit of several, clustered, yellowish, fleshy carpels about 2 cm. long.

Tongatapu: in thicket between Ha'akame village and sea, Mar. 12, 1953. *Yuncker 15283;* in village of Nukunuku, Nov. 18, 1951, *Hürlimann 284.*

Lifuka: in Pangai village, climbing over trellis, Apr. 25, 1953, *Yuncker 15701.*

Vava'u: climbing in thicket near Houma village, May 22, 1953, *Yuncker 16117.*

Rather frequent as a cultivated ornamental, occasionally as an escape. A native of southern China, now widely cultivated in tropical countries. [247] [824]

Tongan name: *mohokoi honolulu.*

The flowers are used to scent oil. [303] [824]

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137 Tongatapu: in crevices on perpendicular face of seaside cliff at Fangaveha, June 7, 1953, *Yuncker 16250*. Believed to be a new record for Tonga, where it is rare.

Known also from Hawaii, Niue, Pitcairn Island, Cook Islands, Tuamotus; rare in Fiji and Samoa.

247 764 824 *Cleome spinosa* L. is occasionally cultivated as an ornamental in villages and cemeteries.

FAMILY CRUCIFERAE

Genus **Lepidium** Linnaeus

Lepidium virginicum Linnaeus, Sp. Pl., 645, 1753.

Erect, much-branched, glabrous or somewhat puberulent herb. Basal leaves up to 12 cm. long, dissected, terminal lobe large, obovate, lateral lobes small, stem leaves alternate, about 2.5 cm. long, oblanceolate, serrate, subsessile, acute. Flowers very small, white, in terminal and axillary, racemose clusters; fruit 3 mm. or less wide, flat, nearly round, notched at apex.

Tongatapu: weed in plantation, Nualei, Oct. 27, 1951, *Hürlimann 5*; roadside east of Nuku'alofa, Mar. 7, 1953, *Yuncker 15206*.

'Eua: weed at Fuai plantation, Mar. 22, 1953, *Yuncker 15418*.

Niuatoputapu: near shore in Hihifo, Dec. 29, 1951, *Hürlimann 645*.

A common dooryard and waste area weed throughout Tonga. An American species now of wide distribution in warm climates.

Genus **Coronopus** Gaertner

Coronopus didymus (Linnaeus) J. E. Smith, Fl. Brit. 2: 691, 1800.

Low, spreading, pubescent, fetid weed. Leaves one- to two-pinnately dissected, the divisions narrowly linear, entire or toothed. Flowers very small, white, in small, axillary, racemose clusters; fruit flattened, deeply notched at apex, wrinkled.

Tongatapu: weed in plantation, Nualei, Nov. 1, 1951, *Hürlimann 102*; weed on sand in cemetery near Haveluliku village, June 3, 1953, *Yuncker 16233*.

'Eua: weed in old coconut plantation near Ha'aluma, Apr. 1, 1953, *Yuncker 15586*.

A plantation and waste-area weed throughout Tonga. This European weed is now of wide distribution in tropical and temperate regions.

Senebiera didyma Pers. in Hemsley's list.

Tongan name: *lesivao*.

Genus **Nasturtium** R. Brown

Nasturtium sarmentosum (Solander) O. E. Schulz, Bot. Jahrb. 32: 595, 1902.

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137 glossy above, pinnately nerved, areolate-nervulose, nervules prominent beneath, petiole about 5 mm. long, stout. Fruit ellipsoidal, brown-scurfy, 4 cm. long.

Vava'u: *Crosby;* near Mataika village, May 27, 1953, *Yuncker 16205.* Infrequent.

Also in Fiji and Samoa.

Tongan name: *hea.*

[247 245 824] The garden rose (*Rosa* spp.) is planted as a common ornamental about dwellings. One depauperate peach tree (*Prunus persica* Siebold and Zuccarini) was seen in Nuku'alofa.

Family CONNARACEAE

Genus **Santaloides** [Linnaeus] O. Kuntze

Santaloides samoense (Lauterbach) Schellenberg, in Engler Bot. Jahrb. 58: 180, 1923; Pflanzenr. 103 [IV. 127]: 122, 1938.

Woody vine, glabrous throughout. Leaves alternate, odd-pinnate, leaflets ovate or round-ovate, acuminate, base rounded, obtuse, blade margin sometimes subpeltately continuous over petiolule, up to 6 cm. or more long and 4 cm. wide, pinnately nerved, areolate venulose, somewhat chartaceous, petiolules about 5 mm. long. Flowers 4-5 mm. wide, white, on slender pedicels about as long as flowers in paniculate clusters.

'Eua: climbing in forest on western slope near summit of central part of eastern ridge, Mar. 24, 1953, *Yuncker 15442.*

Kao: climbing in trees, on rocky forested slope, May 6, 1953, *Yuncker 15890.*

Tongan names: *kavahaha, tuamea.*

The cited specimens agree very well with an isotype of the species, *Vaupel 491* (US), thus providing what appears to be a new generic record for Tonga (A. C. Smith).

Family LEGUMINOSAE

Genus **Serianthes** Bentham

Serianthes myriadenia Planchon, ex Bentham, Hook. London Jour. Bot. 5: 108, 1846.

Broad-topped tree, up to 8 or 10 m. tall, branchlets, leaves, and so forth brown-pubescent. Leaves bipinnate, alternate, pinnae several, up to 10 cm. or more long, leaflets numerous, oblong, obtuse, base cordulate, asymmetrical, about 12 mm. long and 5 mm. wide, sessile. Flowers several, in branching, axillary clusters, calyx about 1 cm. long, dentate, densely pubescent, corolla greenish yellow, up to 2 cm. long, lobed to about middle, pubescent, stamens numerous, exserted, deep red; pod oblong, somewhat compressed.

Vava'u: *Crosby;* at summit of Talau, west of Neiafu, May 23, 1953. *Yuncker 16141.*

Infrequent. Fiji.

Tongan name: *mohemohe.*

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Introduced ornamental. Frequent about dwellings and cemeteries. Occasional as an escape in waste areas. An African species now of worldwide cultivation.

Tongan name: *polosomo.*

FAMILY RHAMNACEAE

Genus **Rhamnella** Miquel

Rhamnella vitiensis (Bentham) A. C. Smith, Torrey Bot. Club, Bull. 70: 544, 1943.

"A small, gnarled tree, up to 3 m. or more tall. Leaves oval. Flowers axillary, the petals pale yellow."

Vava'u: *Crosby.*

Infrequent. From Queensland and New Guinea eastward to Tonga.

Rhamnus vitiensis Benth. in Burkill's list.

Tongan name: *taka.*

Genus **Colubrina** L. C. Richard

Colubrina asiatica (Linnaeus) Brongniart, Ann. Sci. Nat. 10: 369, 1827.

More or less sprawling shrub, or sometimes a small tree up to 3 or 4 m. tall. Leaves simple, alternate, ovate, acuminate, base rounded or subcordate, crenate-dentate, up to 8 cm. or more long and 5 cm. wide, palmately three-nerved, midrib branched upward, nearly glabrous, petioles about 1 cm. long. Flowers small, yellowish green, on slender pedicels, in small, axillary, short-pedunculate, cymose clusters; fruit subglobose, 6-8 mm. in diameter, greenish.

Tongatapu: in seaside thicket along road west of Nuku'alofa, Mar. 7, 1953, *Yuncker 15214;* near Navutoka village, Feb. 27, 1953, *Yuncker 15094;* near beach eastward of Ma'ofanga, Oct. 29, 1951, *Hürlimann 19.*

'Eua: *Lister;* near sea, above Ohonua village, Apr. 2, 1953, *Yuncker 15619.*

Nomuka: margin of thicket on lakeward side of road encircling island, May 30, 1953, *Yuncker 15836.*

Lifuka: seaside thicket toward northern end of island, Apr. 24, 1953, *Yuncker 15703.*

Vava'u: *Crosby;* upper rim of seaside cliff northeast of Leimatua, May 20, 1953, *Yuncker 16059.*

Niuatoputapu: plain south of Falehau, Dec. 7, 1951, *Hürlimann 382.*

Frequent near the shore throughout Tonga. From Africa and India eastward to Polynesia.

Tongan name: *fiho'a.*

The bark and the leaves lather when rubbed in water and may be used as a soap substitute.

1 /Impatiens balsamina -- nalyst/

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Genus **Allamanda** Linnaeus

137 **Allamanda cathartica** Linnaeus var. **hendersonii** (Bull) Bailey and Rafill, Standard Cycl. Hort. 1: 247, 1914.

Woody, vinelike shrub. Leaves opposite or in whorls of three or four, elliptical to subobovate, abruptly acuminate, entire, thick and somewhat coriaceous, midrib prominent, petiole very short. Flowers in axillary and terminal, racemose clusters, corolla yellow, trumpet-shaped, up to 7 cm. or more long, with broad, spreading, rounded lobes; fruit a prickly capsule.

[247 824] Introduced and cultivated for its large and handsome flowers. Frequent in villages. A South American species, now widely cultivated in warm countries.

Genus **Plumeria** Linnaeus

Plumeria acuminata Aiton, Hort. Kew. ed. 2, 2: 79, 1811.

Small, soft-wooded, glabrous tree with thick, spreading branches. Leaves alternate, clustered near ends of branches, elliptic-oblong, acuminate-cuspidate, up to 40 cm. or more long and 6-8 cm. wide, pinnately nerved, midrib prominent, lateral nerves loop-connected near margin, glabrous, petiole stout, up to 6 cm. or more long. Flowers very fragrant, in terminal, cymose clusters, corolla cream or yellowish white, salverform, lobes obovate, longer than tube.

Introduced ornamental. Frequent in villages. A tropical American species now widely cultivated in warm countries.

Tongan name: *kalosipani.*

Plumeria rubra Linnaeus, Sp. Pl., 209, 1753.

Shrub or small tree similar to *P. acuminata* but with pink or red flowers.

An introduced ornamental. Occasional in villages. A tropical American species now widely cultivated in warm countries though usually less frequent than the preceding.

Genus **Alstonia** R. Brown

Alstonia reineckeana Lauterbach, Engler Bot. Jahrb. 41: 233, 1908.

Shrub or small tree up to 3 m. or more tall, with milky latex. Leaves opposite, oval-oblong, acute at both ends, up to 16 cm. or more long and 7 cm. wide, pinnately nerved, petiole 1-2 cm. long. Flowers on slender pedicels in spreading, pedunculate, axillary clusters, corolla tubular, white, about 1 cm. long; fruit paired, curved, acute, orange-colored.

'Eua: margin of forest near center of island, Mar. 19, 1953, *Yuncker 15342.*

Vava'u: near upper rim of seaside cliff, above Ha'alaufuli, May 21, 1953, *Yuncker 16110.*

Occasional. Also in Samoa and Fiji.

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Tongatapu: near dwelling in Nualei village, Mar. 9, 1953, *Yuncker 15235.* 137

Occasional about dwellings and in plantations. A tropical American plant,[1] now widely planted for its use as tobacco.

Tongan name: *tapaka.*

The tomato (*Lycopersicon esculentum* Miller), the potato (*Solanum tuberosum* Linnaeus), and the eggplant (*S. melongena* Linnaeus var. *esculentum* Nees) are cultivated to some extent as food crops. Many varieties of petunia (*Petunia hybrida* Vilmorin) are grown for ornament. [824] [244] [262] [247]

Family SCROPHULARIACEAE

Genus **Lindernia** Allioni

Lindernia crustacea (Linnaeus) F. Mueller, Census, 97, 1882.

Small, much-branched herb, 10-20 cm. tall, stems angled and slightly winged along ridges. Leaves opposite, ovate, acute at both ends, serrate, up to about 1 cm. long, sparsely pubescent, petiole very short. Flowers 5-8 mm. long, pale lavender, solitary on rather long, slender, axillary pedicels; capsule obovate-elliptical, compressed, about 3 mm. wide.

Kao: on thin rocky soil in open alpine area, alt. 600-700 m., May 6, 1953, *Yuncker 15925, 15930.*

Vava'u: *Crosby.*

Infrequent. A native of the Old World tropics; now of wide distribution in warm climates of both hemispheres.

Genus **Russelia** Jacquin

Russelia equisetiformis Schlechtendal and Chamisso, Linnaea 6: 377, 1831.

Semi-shrubby plant, up to about 1 m. tall, with longitudinally ridged, green stems, and numerous verticillately arranged, drooping branches. Leaves very small, linear or awl-shaped, whorled. Flowers about 2.5 cm. long, in lax, terminal clusters, corolla tubular, red.

Occasional in villages. A Mexican species, now widely cultivated in warm countries as an ornamental.

Family BIGNONIACEAE

Genus **Stenolobium** D. Don

Stenolobium stans (Linnaeus) D. Don, Edinb. Philos. Jour. 9: 88, 1823.

Large shrub, about 4 m. tall. Leaves opposite, pinnate, leaflets five to 13, narrowly elliptic, up to 10 cm. or more long and 3 cm. wide, serrate, acuminate, base cuneate, sessile, pinnately nerved. Flowers in large, terminal, paniculate clusters, corolla up to 5 cm. long, yellow, narrowly bell-shaped, ornamental; fruit narrow, up to about 10 cm. long.

Tongatapu: near dwelling in Nuku'alofa, Mar. 7, 1953, *Yuncker 15200.*

An American species, now widely planted as an ornamental in warm countries.

1 /Nicotiana tabacum -- Analyst/

76: Yuncker N-4,5 (1953) 1959 OU9 Tonga OU9

Genus **Youngia** Cassini

Youngia lyrata Cassini, Ann. Sci. Nat. 23: 88, 1831. 137

Slender herb, up to 30 cm. or more tall. Leaves alternate, lyrate, lobes with small, spinelike teeth, basal leaves up to 5 cm. long, much reduced upward. Flower heads scarcely 5 mm. long, numerous, yellow, on slender peduncles up to 2 cm. long, in much-branched, terminal and axillary clusters, pappus bristles capillary, white.

Tongatapu: weed in plantation near Nualei village, Mar. 9, 1953, *Yuncker 15227*.

Probably also grows elsewhere in Tonga as a plantation weed. Asia.

Ornamental species noted in cultivation are *Chrysanthemum* spp., *Coreopsis tinctoria* Nuttall, *Cosmos* spp., *Dahlia pinnata* Cavanilles, *Helianthus* spp., *Tagetes* spp., and *Zinnia elegans* Jacquin. [824] [247]

[p.272 is blank]

137 Teve (Amorphophallus campanulatus). This traditional
262 Pacific aroid, although supposedly eaten as a starch in the past, is rarely if ever eaten and is found only occasionally in a wild state on bush allotments.

241 Other miscellaneous food plants. There are a number of other, introduced food plants which are grown on an infrequent basis, primarily on town allotments, such as roselle - lasipeli (Hibiscus sabdariffa).

Important Non-food Plants

There are a considerable number of important non-food plants (not including large trees), which are also commonly found on bush and town allotments throughout Tongatapu; these include:

248 Paper mulberry - hiapo (Broussonetia papyrifera). Of
287 East Asiatic origin and ancient introduction into the Pacific (Yuncker, 1959: 97), paper mulberry is traditionally one of Tonga's most widely grown, non-food plants, its fibrous inner bark being used to make tapa cloth or ngatu.
248 It is grown on a large number of bush allotments throughout Tongatapu, either alone or intercropped with other subsistence crops. It takes about 12 to 18 months to mature, can be cut continuously for a number of years and is often found in bush fallow associations where it remains useful for the production of tapa cloth.

247 Screwpine (Pandanus spp.). Although commonly found growing naturally throughout Tongatapu, there are a number

247 of non-arborescent varieties, some of which were either aboriginal or post-European introductions from other island groups (Stone, 1970; 149). These are found in a cultivated state, usually in small patches or as borders around allotments or gardens, or naturalized amongst the secondary vegetation. The most common types of the shrub-like variety are tofua, tapahina, tutuila and loukie; other types which are more arborescent include paongo and a number of varieties of fā.

249 Polynesian arrowroot - mahoa'a or mahoa'a Tonga (Tacca leontopetaloides). Polynesian arrowroot, probably of Southeast Asian origin, appears to have been introduced very early into the Pacific Islands (Massal and Barrau, [287] 1956: 11). Although used to a greater extent in the past as a source of edible starch, it is now primarily cultivated for its tubers which are used in the preparation of paste for the tapa making process. It is found on many bush allotments intercropped with yams, giant taro or taro, as well as in a wild state amongst secondary vegetation.

Tobacco - tapaka Tonga (Nicotiana tabacum). A native of South America and probably of early post-European introduction (Baker 1970: 156-157; Parham, 1972: 329), tobacco is cultivated on a number of town and bush allotments. It is planted alone in small patches or intercropped 137 with yams, plantains or other crops. A wild variety Nicotiana fragrans, known as tapaka Tonga (Tongan tobacco),

245 Hedge or fence plants. There are also a variety of plants that are used on both town and bush allotments as hedges, borders or "living fences". The most common is Nothopanax spp. (tanetane), which is commonly planted throughout Tongatapu as a living fence. Other species which are used in a similar fashion are: Hibiscus spp. (kaute); Erythrina variegata var. orientalis (ngatae); Cordyline terminalis (si); Acalypha wilksiana (kalakala'-apusi); Thunbergia erecta (paipa); and Crinum asiaticum (samoa).

247 Valuable flower plants. There are also a number of valuable flowering plants, the flowers of which are useful in the making of leis (kahoa) and other traditional adornment. Some of the most important species include: Gardenia taitensis (siale tonga); Gardenia jasminoides (siale matalateau); and Hibiscus spp.

Important Tree Species

245 One of the most salient features of the plant assemblages of bush and town allotments is the great variety of useful tree species. Many are introduced species with valuable edible fruit, but probably of even greater importance is the diversity of uses that Tongans have for almost every tree found growing on bush and town allotments. Some species are planted purposefully, whereas others occur naturally and are protected or preserved when the secondary vegetation is cleared for

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have been distributed by the Department of Agriculture as part of a reforestation scheme.

Common Weeds and Secondary Vegetation Species

137
[262]

There are a great number of common weed species found throughout Tongatapu in secondary vegetation associations, many of which are eaten or are used in some beneficial way (see Appendix E)[A] as well as serving as reliable indicators of both soil fertility and the period of time that land has been under fallow. Some of these weedy species are possibly native to Tonga, but a majority of them are post-European contact introductions which have become dominants in most secondary vegetation associations (Merrill, 1945: 119). In some cases, they were deliberate introductions as ornamentals or fodder grasses, such as Lantana camara, Panicum maximum, Rhynchelytrum repens, Melinis minutiflora and Mimosa pudica (Government of Tonga, 1949: 4; Yuncker, 1959: 62). The most common weed species on Tongatapu and the assumed places of origin are listed below:

[246]
[247]

A majority of the common weeds seem to be native to tropical America; these include: te'ekosi (Ageratum conyzoides); tu'ulapepe or vavae kona (Asclepias curassavica); fisi'uli (Bidens pilosa); misimisi (Canna indica); te'epulu or tenqafefeka (Cassia tora); hefa (Cenchrus echinatus); piini or piisi (Crotalaria mucronata); lau veveli (Elephantopus mollis); 'akauveli (Indigofera

[A] [See Category 137, pp. 377-431--Analyst.]

metal adzes (toki Tonga), owned by only 2 percent of the sample households. In the cases of machetes, hele pelu, and the two most important spades, the huo keli and the huo lafalafa, many households owned more than one of each. Rakes and shovels are commonest in the urban area of Nuku'alofa where ornamental gardens are more prevalent.

Using only these implements, most Tongan farmers cut down the bush or forest vegetation and after burning the accumulated plant material after drying, prepare the land for planting, plant, weed, and harvest the different crops. An increasing number of farmers, however, are beginning to use the tractor-pulled plow and disc-harrow and, although only one out of 141 households owned a tractor, 53 percent have had their allotments plowed at one time or another, mostly by the Coconut Replanting Scheme or the Agriculture Department for planting new coconuts or other export crops. Of the 140 households interviewed, 43 percent felt that plowing was good for the soil, 44 percent felt that it was bad and caused the soil to become infertile, 13 percent had no opinion. Regardless of the feeling of the average Tongan the Agriculture Department, the Coconut Replanting Scheme, and the Produce Board have been advocating the use of the plow rather than burning the dried vegetable matter. Although the Agriculture Department has experimented with draught animals for plowing, Tongans have never adopted this practice (Government of Tonga, 1952:3).

241 Granadilla or pasiona (Passiflora quadranqularis) was
245 found on only 1 of the sample allotments along a trail through one-year bush fallow vegetation.

241 None of the supplementary crops seemed to be localized in particular regions of Tongatapu.

Important Non-Food Crops

Throughout the matrix of major staple crops and secondary vegetation, there are also a considerable number
[125] of important non-food crops (Table 34). The survey of these, like that of supplementary food plants, emphasized frequency and abundance with a secondary concern for the areas occupied by the few species which are planted alone in homogeneous plots.

241 The most widespread non-food plant which is cultivated
247 or at least protected on bush allotments is pandanus
[285] (Pandanus spp.). The leaves or lou'akau are used as fiber for weaving baskets, fine mats, and other plaited material. These species are more bush-like than the common screwpine or fā (Pandanus tectorius) and are found as borders, alone in homogeneous plots, amongst secondary vegetation as relics and volunteers, and in coastal and swamp forests on many allotments. Of the 76 sample allotments where pandanus was present, 32 had more than 25 plants, 21 had 10 to 25 plants, and 23 had less than 10. Of the 32 allotments with more than 25 plants, 4 had solid plantings of Pandanus averaging about .02 acres (.01 hectares).

241 Table 34. Frequency of occurrence of specified non-food plants on 101 bush allotments.

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Plant	Number of Allotments
Pandanus	76
Paper Mulberry	38
Bamboo	11
Heliconia	9
Cycad	7
Job's tears	6
Hedychium	6
Miscanthus	5
Polynesian Arrowroot	4
Alyxia	4
Cotton	3
Tobacco	2
Tumeric	2
Evodia	2

241 Paper mulberry or hiapo (Broussonetia papyrifera) is
248 second to Pandanus in frequency but occupies more area. It was present on 38 sample allotments and on half of these was the dominant crop on plots averaging about 0.40 acres (.16 hectares). On the other allotments it was interplanted amongst other crops or existed as a volunteer in bush fallow. Such was the case on an allotment near Lapaha,

241 fruit (Passiflora spp.)

[247] [248] Of the non-food plants which are cultivated and protected, the most common are a number of species of Pandanus and paper mulberry (Broussonetia papyrifera). There are also numerous other plants which are cultivated or protected because of the value of their fruit, flowers, leaves, roots, bark, and wood for such purposes as the preparation of handicrafts, folk medicines, dyes, scented coconut oil, decorations, and adornment (Appendix E).A

241 245 Although the major staple and commercial crops tend to dominate the cultivated acreage of bush allotments, the most prominent plants are usually coconut palms and a great range of important tree species. The coconut palm, which was present on over 90 percent of the surveyed bush allotments, is by far the most common and most important cash crop on Tongatapu as well as being of considerable subsistence value. On allotments without palms, insecurity of tenure, unsuitable soil, and the threat of frequent fires were often the reason for their absence. 50 percent of the allotments also had newly planted palms.

Other useful trees, primarily important because of their edible fruit, which seem to be present on over half of Tongatapu bush allotments, include: mango (Mangifera indica), citrus trees (Citrus spp.), tava (Pometia pinnata), breadfruit (Artocarpus altilis), Tahitian chestnut (Inocarpus edulis), and guava (Psidium guajava). Other

A[See Category 116, pp. 377-431—Analyst.]

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318 There are also a number of species which have been introduced by the government as part of afforestation schemes; these include: Grevillea robusta, Eucalyptus spp., and Cedrela odorata, which have been planted on some allotments.

241 On bush allotments the fallow or secondary vegetation has a very important role in the cropping succession.

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137 Approximately two-thirds of the area of bush allotments is under some stage of bush fallow or natural vegetation, ranging in composition from native coastal forests, mangrove swamps, tropical lowland forests, and mature stands of secondary forest, to ephemeral associations of pioneer weed species. About 14 per cent of the sample allotments were completely under various stages of fallow vegetation; in no case was an individual allotment under 100 percent cultivation. There were very few areas under what Boserup (1965:15) classifies as forest fallow: under fallow for

[311] sufficient time for forest to regenerate. Only 9 percent of the uncultivated acreage was over ten years of age, and a majority of this was actually uncultivable coastal or swamp forest. Another 21 per cent had been under fallow for approximately five to ten years and the remaining 70 percent had been under fallow for less than five years and was characterized by bushes, grasses, ephemeral pioneer species, and few trees.

In those areas which had been under fallow for over five years, the dominants are usually native tree species,

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181 515 [356] In general, the Tongans have kept the cleanliness and love of order characteristic of the Polynesians. The huts inside usually look quite tidy and clean, and in personal grooming people are fairly conscientious. This has increased to a certain extent through teaching of hygiene in all schools, so that one scarcely meets a Tongan with long, black-bordered fingernails or toenails. However, on the 181 351 178 Tongan plantations orderliness often leaves much to be desired and the neatly plaited fences praised by earlier observers (41)

[113] 41. For example, J. Cook, loc. cit. p. 163; G. Forster, loc. cit. IV, p. 323/324; J. Wilson, A missionary voyage to the southern Pacific Ocean/cited in English/. London 1799. pp. 102, 245; Ch. Wilkes, loc. cit. p. 13.

are today to be found neither on the plantation (where at most a single barbed wire constitutes the fence) nor in the villages. (42)

42. Only a few villages have a (usually uncared-for) stockade-style fence (coconut palm trunks) to set off plantings.

[247] In the latter there is also not always painstaking order and cleanliness, and one seldom comes across a property owner who has planted flowers and ornamental bushes for beauty. (43)

[113] 43. Compare with this G. Forster, loc. cit. pp. 325, 340; J. Cook, Voyage dans l'Hemishpere Austral /Voyage in the southern hemisphere/ vol. II. Paris 1778. p. 68.

181 351 178 461 [356] Most of the wooden houses in need or repair are so neglected that they are practically falling apart. The untidiness of many plantations is usually due to the often rather long approach to them required by their owners and the proliferating weeds resulting from climate conditions, whereas the lack of orderliness in the villages may be regarded as a direct result of European influences which also brought